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Original Research Article

Pattern and features of menstruation among adolescent girls in Haldwani: a cross-sectional study

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ABSTRACT

Background: Menstruation becomes an important aspect in life of an adolescent girl once she attains puberty and is often associated with variable characteristics. Being a development process and a reported significant source of morbidity too, it becomes important to study its pattern and characteristics. The purpose of this study was to determine the pattern of menstruation among adolescent girls.

Methods: A cross sectional study was conducted among 574 adolescent girls of 10-19 years age of 6th to 12th grades in four selected government and private schools of Haldwani. Data was collected using a predesigned semi-structured questionnaire with brief interview and examination. Analysis of data was done with help of SPSS version 21.

Results: Mean age of the girls was 14.95±1.41 years. Mean age at menarche was 12.94±1.01 years. Majority of girls 441 (76.82%) had cycle length of 21-35 days and it was found that 95 (16.55%) girls had irregular menstrual periods. Rural and urban differences in regularity of menstruation were statistically significant. Duration of flow in majority 300 (52.26%) of girls was 2-4 days followed by 5-7 days in 222 (38.68%). Dysmenorrhoea was reported by 422 (73.52%) of adolescent girls and of them 259 (61.37%) have never used analgesics while 66 (15.63%) have always used analgesics. Girls with absence of pallor were 1.2 (0.8-1.9) times more likely to have regular menstruation as compared to those showing pallor.

Conclusions: Irregular menstruation was common among girls and significant association was found with place of residence. Dysmenorrhoea was present in three-fourth of adolescent girls still majority of them have never used analgesics. Daily routine was affected in more than 80% of girls during menstruation.

Keywords: Adolescent, Dysmenorrhea, Menarche, Menstrual pattern

INTRODUCTION

Adolescence is a period between childhood and adulthood, a transition phase characterised by discernible reproductive maturity. As per definition of World Health Organization, the period of adolescence ranges from 10-19 years of age.¹ India has largest population of adolescents and of the total female population in India 10.7% and 9.7% are girls in the vulnerable age groups of 10-14 years and 15-19 years respectively.² Adolescent girls face substantial morbidities related to menstruation

which are generally unrecognized and uncared due to unfamiliarity of girls or, difficulty in understanding normal characteristics of their menstrual cycles and further their reluctance to discuss this issue.³

Attainment of menarche at appropriate age signifies and assures normal development and functioning of the female reproductive system. However, it's timing and subsequent progression are individual-specific and vary within a broad range of normality depending on maturation of the complex interactions of hypothalamus,

pituitary gland and ovary. Menarche typically occurs within 2-3 years after thelarche at Tanner stage IV breast development usually between 12 and 13 years.^{3,4} Among Indian females the mean age at menarche is 13.76 years with a secular decline of nearly one month per decade.⁵

Disturbances of menstrual bleeding manifest in a wide range of presentations and abnormal uterine bleeding (AUB) is the overarching term used to describe any departure from normal menstruation or from a normal menstrual cycle pattern. The key characteristics are regularity, frequency, heaviness of flow, and duration of flow, but each of these may exhibit considerable variability.⁶ As evident from previous literature, usually after third year of menarche the interval between bleeding periods is in the range of 21-34 days, with a flow lasting from 3 to 7 days and a mean menstrual blood loss of 35 ml (range 5-80 ml).³⁻⁸

Significant variations may be somewhat physiologic first few years after menarche or, may be attributable to significant underlying medical issues like polycystic ovary syndrome, thyroid problems, mental stress, hypothalamic dysfunction, primary pituitary disease, primary ovarian insufficiency, coagulopathies, uterine lesions and rarely malignancy.³ And therefore it is important to have an understanding of the menstrual pattern and its characteristics among adolescent girls. Hence the present investigation was conducted to study the pattern and features of menstruation among adolescent girls.

METHODS

This cross-sectional study was conducted among adolescent girls of 10-19 years from four different government and private schools in rural and urban areas of Haldwani block of Nainital district, Uttarakhand. A total of 574 adolescent girls participated in the study. Before conducting the research, girls were acquainted with the purpose and procedure of the research. They were informed that their participation is voluntary, and they can quit any time. With assurance of confidentiality, informed verbal consent was taken. A pre-designed semi-structured questionnaire with interview and brief examination was used. The school authority was requested, not to be present during the questionnaire and students were assured that the information provided by them would remain confidential and thus encouraged to be truthful in their responses. The questionnaire covered the general socio-demographic information, date of birth, questions related to menstruation including age at menarche, duration of menstruation, cycle length, regularity of menstruation, dysmenorrhea, use of analgesics and impact of menstruation on daily routine and school attendance. Age at menarche was obtained by using recall method and for that girls were asked to remember the grade at which they started having menses. The gynaecological age was calculated by subtracting the age at menarche (in completed years) from the calendar

age (in completed years). The menstrual cycles were considered irregular when length of the menstrual cycle was between 22 and 41 days; and two or more menstrual cycles with a length of less than 22 or more than 41 days during the past 12 months.⁸ Weight and height of girls was measured by using standard methods and further used to calculate the body mass index (BMI), which was further classified into thinness, normal weight and overweight based on the cut off points recommended by World Health Organization.⁹

Inclusion criteria

- Girl students of grades 6th to 12th in selected schools

Exclusion criteria

- Girls with age <10 and >19 years those who had not attained menarche at the time of study or had attained menarche less than one year prior to study
- those who couldn't remember the exact time of menarche.

Statistical analysis

Data was analysed by using SPSS version 21. The Chi square test was used for assessing statistically significant association among variables. The statistical significant association was considered when two-tailed p value <0.05. Binary logistic regression was used to estimate the odds ratios (ORs) and 95% confidence intervals (CIs) to assess the possible differences.

RESULTS

Mean age of adolescent girls in present study was 14.95±1.41 years. 242 (42.16%) were in 10 to 14 years age category and 332 (57.84%) in 15 to 19 years age category. According to place of residence 297 (51.74%) and 277 (48.26%) belonged to rural and urban areas respectively. Most of selected girls 388 (67.59%) were from the government schools and rest 186 (32.41%) from private schools. None of girls in present study was married. Majority of girls 319 (55.57%) were Hindu by religion in this study and according to modified BG Prasad classification, majority belonged to social class III. As stated by them most of them 457 (79.61%) were taking mixed diet and rest 117 (20.38%) were vegetarian. Majority of girls 354 (61.7%) belonged to nuclear type of families. Birth order of 196 (34.14%) of girls was first followed by second in 132 (22.99%) and in majority 246 (42.86%) it was third or more. On clinical examination 192 (33.45%) of girls have pallor, and 81 (14.11%) and 107 (18.64%) girls were thin and stunted respectively (Table 1). Mean age at menarche among girls in present study was 12.94±1.01 years. Majority of girls 219 (38.15%) have attained menarche at the age of 13 years followed by at 12 years in 149 (25.96%) and at 14 years in 137 (23.87%). 38 (6.62%) and 26 (4.53%) of adolescent girls have attained menarche at 11 and 15

years respectively, and fewer of them 3 (0.52%) and 2 (0.35%) at 10 and 16 years respectively (Figure 1).

Table 1: Socio-demographic characteristics of adolescent girls (n=574).

Socio-demographic characteristics	Frequency	%
Age category		
10 to 14 years	242	42.16
15 to 19 years	332	57.84
Place of Residence		
Rural	297	51.74
Urban	277	48.26
Type of School		
Government	388	67.59
Private	186	32.41
Religion		
Hindu	319	55.57
Muslim/Others	255	44.43
Type of family		
Nuclear	354	61.67
Joint	220	38.33
Birth Order		
First	196	34.14
Second	132	22.99
Third or more	246	42.86
Food habits		
Vegetarian	117	20.38
Mixed	457	79.61
Socio-economic status		
I	21	3.66
II	117	20.38
III	212	36.93
IV	138	24.04
V	86	14.98
Pallor		
Present	192	33.45
Absent	382	66.55
BMI for age		
Thinness	81	14.11
Normal	464	80.84
Overweight	29	5.05
Height for age		
Stunted	107	18.64
Normal	467	81.36

Regarding the characteristics of menstrual cycle among the girls in present study majority 441 (76.82%) had cycle length of 21-35 days followed by ≥ 36 days in 87 (15.15%) and ≤ 20 days in 46 (8.01%). Majority of girls 300 (52.26%) stated that duration of flow was 2-4 days followed by 5-7 days in 222 (38.68%). 31 (5.4%) and 21 (3.66%) of girls had >8 days and <2 days of flow respectively. 95 (16.55%) of girls had irregular cycles. In present study total of 422 (73.52%) girls were experiencing dysmenorrhea. Passage of clumps/clots was reported by 191 (33.27%) adolescent girls (Table 2).

Table 2: Menstrual characteristics of adolescent girls (n=574).

Menstrual Characteristics	Frequency	%
Length of cycle		
≤ 20 Days	46	8.01
21-35 Days	441	76.82
≥ 36 Days	87	15.15
Days of flow		
<2 days	21	3.66
2-4 days	300	52.26
5-7 days	222	38.68
>8 days	31	5.4
Regularity of cycles		
Regular	479	83.45
Irregular	95	16.55
Dysmenorrhea		
Present	422	73.52
Absent	152	26.48
Passage of clumps/clots		
Present	191	33.27
Absent	383	66.73

Majority of girls have cycle length of 21-35 days at all gynaecological ages whether 1, 2, 3 or ≥ 4 years post menarche. Short cycles of ≤ 20 days were more common among the adolescent girls with gynaecological age of 1 or 2 years. As in present study it was found that in 12 (6.97%) and 10 (5.4%) girls out of total girls with gynaecological age of 1 and 2 years respectively have cycle length of was ≤ 20 days as compared to 14 (9.27%) and 10 (15.15%) among girls with 3 or ≥ 4 years post menarche. While no significant difference was found in occurrence of longer cycles at different gynaecological ages (Figure 2).

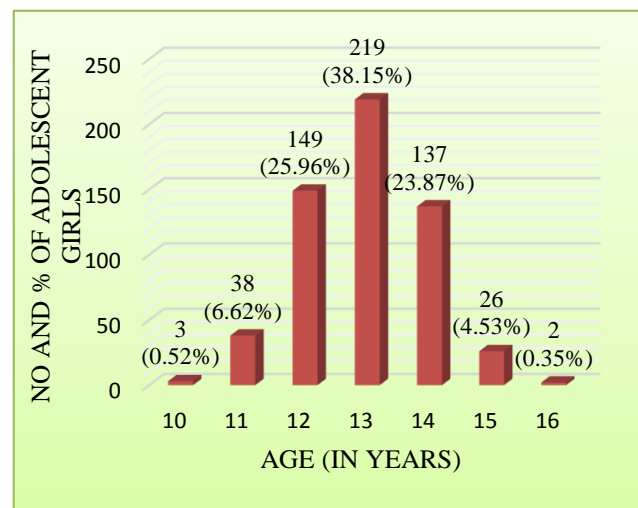


Figure 1: Distribution of adolescent girls according to age of menarche (n=574).

In present study 422 (73.51%) adolescent girls were experiencing dysmenorrhea. Of the total girls having dysmenorrhea majority of girls 259 (61.37%) have never

used analgesics during menstruation while 66 (15.63%) and 97 (22.98%) girls have reported the use of analgesics to be always and sometimes respectively. Among the girls with dysmenorrhea 71 girls have irregular menstrual cycles and of them 24 (33.8%) have never used analgesics while 8 (11.26%) and 39 (54.92%) have used analgesics always and sometimes during menstruation respectively (Figure 3).

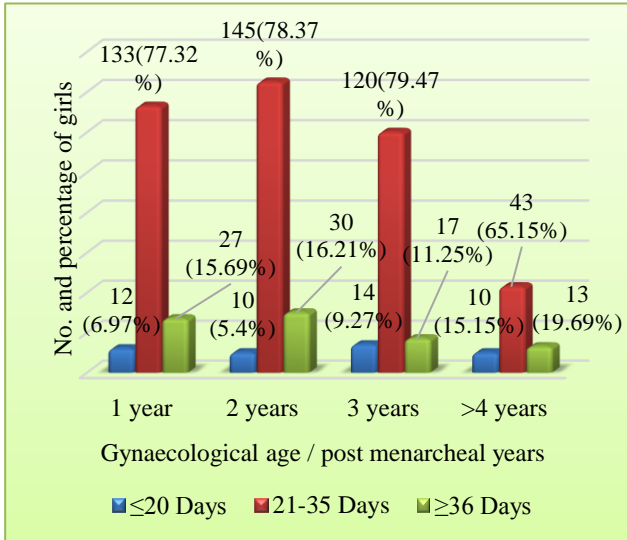


Figure 2: Cycle length according to gynaecological age of adolescent girls (n=574).

Bivariate analysis shows the Odds of having regular menstruation was 1.2 (0.7-1.9) among the girls in 15-19 years age category as compared to 10-14 years category. It was found that place of residence and the type of school was significantly associated with regularity of menstruation, as the girls residing in urban area and belonging to government schools are more likely to have regular menstrual cycles.

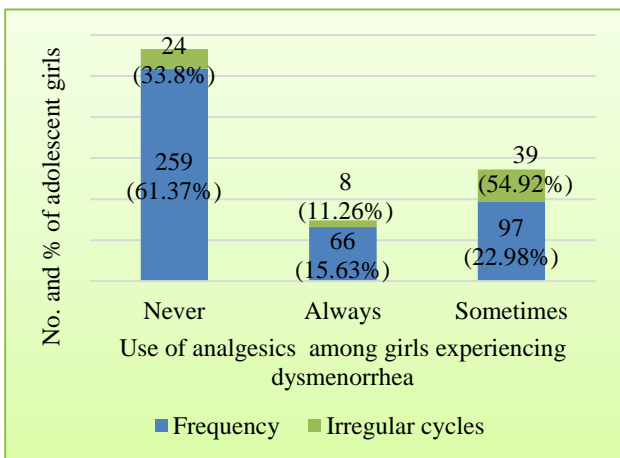


Figure 3: Use of analgesics and irregular menstrual cycles among the adolescent girls experiencing dysmenorrhea (n=422).

Corresponding Odds ratios were belonging to urban place of residence (OR 1.5, 95% CI 1.0-2.4) and studying in private schools (OR 0.6, 95% CI 0.4-1.0) in association with regularity of cycles. Stratification according to birth order showed that Odds of having regular menses were 0.7 (0.3-1.3) and 0.6 (0.3-1.1) in girls with second birth order and birth order third or more respectively in comparison to girls with first birth order with no significant association. 17.87% of Hindu girls have irregularities in their menstrual cycles as compared to only 14.90% of girls belonging to Muslim and others category in present study, and the difference being statistically insignificant (p=0.342). In present study it was found that regular menstruation was significantly more common among girls belonging to nuclear families as compared to joint families (p=0.027). Consumption of vegetarian and mixed diet has been found to have no significant effect on regularity of menstruation in present study. Students having comparison of regularity between those belonging to socioeconomic status III, IV and V showed ORs of 1.3 (0.4-4.0), 2.3 (0.7-7.3) and 1.4 (0.4-4.6) respectively as compared to socioeconomic class I (Table 3). Comparing the findings of clinical examination, it was found that girls with absence of pallor were 1.2 (0.8-1.9) times more likely to have regular menstruation as compared to those showing pallor. No significant difference was found in regularity of menses when compared among girls with thinness, normal BMI for age and overweight (p>0.05). However, the girls with normal height for age were 1.2 (0.6-2.0) times more likely to have regularity as compared to those with stunting (Table 3). Majority of girls reported that their daily routine was affected during menstruation while in only 107 (18.64%) of girls' menstruation had no effect on daily activities. Resting hours were prolonged during menstruation in 269 (46.86%) girls. However, 83 (14.45%) girls have reported the absence from school during menstruation. As stated by 156 (27.17%) girls they have attended schools but had less concentration on studies (Figure 4).

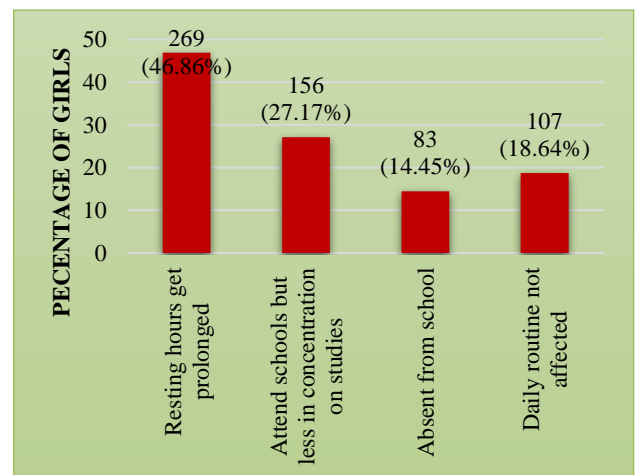


Figure 4: Cycle Effect of menstruation on daily routine of adolescent girls (Multiple Response).

Table 3: Bivariate analysis of socio-demographic factors with regularity of menstruation among adolescent girls (n=574).

Characteristics	Irregular (n=95)	Regular (n=479)	p value*	OR (95% CI)**
Age category				
10 to 14	44 (18.18)	198 (81.82)	0.369	1
15 to 19	51 (15.36)	281 (84.64)		1.2 (0.7-1.9)
Place of Residence				
Rural	58 (19.53)	239 (80.47)	0.047#	1
Urban	37 (13.36)	240 (86.64)		1.5 (1.0-2.4)
Type of school				
Government	56 (14.43)	332 (85.57)	0.049#	1
Private	39 (20.97)	147 (79.03)		0.6 (0.4-1.0)
Religion				
Hindu	57 (17.87)	262 (82.13)	0.342	1
Muslim/Others	38 (14.90)	217 (85.10)		1.2 (0.7-1.9)
Type of family				
Nuclear	49 (13.84)	305 (86.16)	0.027#	1
Joint	46 (20.91)	174 (79.09)		0.6 (0.3-0.9)
Birth order				
First	26 (13.27)	170 (86.73)		1
Second	23 (17.42)	109 (82.58)		0.7 (0.3-1.3)
Third or more	46 (18.70)	200 (81.30)	0.297	0.6 (0.3-1.1)
Food habits				
Vegetarian	18 (15.38)	99 (84.62)	0.704	1
Mixed	77 (16.85)	380 (83.15)		0.8 (0.5-1.5)
Socio-economic status				
I	5 (23.81)	16 (76.19)	0.426	1
II	20 (17.09)	97 (82.91)		0.5 (0.4-4.6)
III	39 (18.40)	173 (81.60)		1.3 (0.4-4.0)
IV	16 (11.59)	122 (88.41)		2.3 (0.7-7.3)
V	15 (17.44)	71 (82.56)		1.4 (0.4-4.6)
Pallor				
Present	36 (18.75)	156 (81.25)	0.315	1
Absent	59 (15.45)	323 (84.55)		1.2 (0.8-1.9)
BMI for age				
Thinness	14 (17.28)	67 (82.72)	0.802	1
Normal	75 (16.16)	389 (83.84)		1.0 (0.5-2.0)
Overweight	6 (20.69)	23 (79.31)		0.8 (0.2-2.3)
Height for age				
Stunted	20 (18.69)	87 (81.31)	0.509	1
Normal	75 (16.06)	392 (83.94)		1.2 (0.6-2.0)

Figures in parentheses denote row percentages; *Chi-square test, Fisher exact test; OR=Odds Ratio, CI=Confidence Interval ** Reference category is first; # Statistically significant, p value (two-tailed) <0.05

DISCUSSION

Being the most striking milestone the onset of menstruation and its subsequent pattern play an important role in the life of an adolescent girl and has potential for long-term health consequences.

The present study apprised about menstrual health particularly its variable pattern among school going adolescent girls in Haldwani. Despite variations in menstrual characteristics worldwide and within India, mean age at menarche has remained between 12 years and 13 years as evident from previous studies.

Menarche typically occurs within 2-3 years after thelarche (breast budding), at Tanner stage IV breast development, and is rare before Tanner stage III development. By 15 years of age, 98% of girls had menarche.³ According to Pathak et al the mean age at menarche among Indian females is 13.76 years (95% CI: 13.75, 13.77) with a reduction of nearly one month per decade, suggesting a secular decline.⁵ In present study mean age at menarche was 12.94±1.01 years and majority of girls 219 (38.15%) have attained menarche at the age of 13 years followed by at 12 years in 149 (25.96%) and at 14 years in 137 (23.87%). These findings are consistent with Nair et al in Delhi, Tarannum et al in

Aligarh, Mittal et al in Haryana, Thakre et al in Nagpur and other studies in different parts of India.¹⁰⁻²⁰ While considerably higher age of menarche has been reported by Kanotra et al in Maharashtra and Indupalli in Karnataka.^{21,22} This variation may be due to the recall bias in latter studies as age of study subjects was higher and time between the occurrence of menarche and data collection was protracted.

Within the earlier years after the menarche, menstrual cycle length tends to be longer due to immaturity of hypothalamic-pituitary-ovarian axis and after third gynaecological year it becomes normal ranging between 21 and 35 days in 60 to 80% cycles.³ However no significant difference has been found in occurrence of longer cycles at different gynaecological ages in present study. In present study majority of girls 441 (76.82%) had cycle length of 21-35 days, measured as interval between the first days of consecutive menstrual periods, and this is similar to findings reported by Ambade et al in Nagpur and Iyer et al in Bhopal where cycle duration was less than 21 days in only 6.8 % and more than 35 days in 5.5%.^{14,16} Kanotra et al in Maharashtra found intermenstrual interval or, the cycle length of 28-35 days in 92.9% of girls, 35-40 days in 6.2% and >40 days in 0.9%.²¹ Variation in length of the menstrual cycle is wide and short cycles of ≤ 20 days have been seen in 8.01% girls and longer ones of ≥ 36 days in 15.15% in present study. Comparable is evident from results of Rigon et al in Italy where 3.0% (95% CI: 2.5-3.4) of the girls had menstruation intervals of less than 21 days, while it was more than 35 days in 3.4% (95% CI: 2.9-3.9).⁷ De Sanctis et al in Italy reported that 85.5% of school girls had normal length of 21-35 days and Sharma et al in Nepal found 74.2% girls having cycle length 21-35 days.^{23,24}

Studies have shown optimum 3-5 days of flow is usual among girls and is considered normal besides comprehending above and below this range as heavy and scanty flow respectively.¹³⁻³¹ Consistent with this in present study majority of girls 52.26% had 2-4 days bleeding followed by 5-7 days in 38.68% and small proportion had >8 days (5.4%) and <2 days (3.66%). Esimai et al in Nigeria reported duration of flow of less than 2 days in 18(4.5%) and 2(0.5%) duration of flow of over 8 days.²⁵ Solanki et al in Bhavnagar found most common menstrual pattern of 3-5 days followed by 5-7 days.²⁶ Duration of flow of <2 days had been reported among 1.6% adolescent girls by Lee et al in Malaysia.²⁷ Similar findings have been reported in India by Thakre et al where 1% girls had menstrual period for <2 days.¹³ Urban girls were found to have prolonged menses or, >5 days menstrual duration which was significantly higher, in study by Salve et al in Aurangabad.²⁸

Dysmenorrhea is defined as pain during menses in the absence of an identifiable pathologic lesion, with an unclear cause and is highly prevalent and a leading cause of morbidity among adolescent girls.²⁹ It may lead to school absence and nonparticipation in routine activities.

In present study total of 422 (73.52%) girls were experiencing dysmenorrhea. And if we see the use of analgesics, it was found that of the 422 girls experiencing dysmenorrhea, 259 (61.37%) girls have never used analgesics while 66 (15.63%) and 97 (22.98%) girls have reported the use of analgesics to be always and sometimes respectively. Other studies worldwide and in India too have shown high prevalence of dysmenorrhea among girls.³⁰⁻³⁷ In present study majority of girls reported that their daily routine was affected during menstruation and in only 107 (18.64%) it had no effect on daily activities. However, 83 (14.45%) girls have reported the absence from school during menstruation. Cakir et al in Turkey and Miuro et al in Uganda found school absenteeism in 10% and 17.3% of girls respectively.^{30,37}

Irregular menstrual cycles during puberty may be considered part of development or, may also be associated with similar causes as known in adults and it has been shown in some previous studies that menstrual cycle irregularities/abnormalities may continue during adulthood and in the end will be associated with subfertility.³ And these menstrual irregularities are more common among younger girls, becoming less frequent few years after menarche. Different definitions of irregularity have been used in different studies and obviously it leads to variations in prevalence of irregularities in different studies. In present study 95(16.55%) of girls had irregular menstrual cycles and the Odds of having regular menstruation was 1.2 (0.7-1.9) among the girls in 15-19 years age category as compared to 10-14 years category. It was found that place of residence and the type of school was significantly associated with regularity of menstruation, as the girls residing in urban area (OR 1.5, 95% CI 1.0-2.4) and belonging to government schools (OR 0.6, 95% CI 0.4-1.0) are more likely to have regular menstrual cycles. This is inconsistent with finding of Salve et al in Aurangabad found where regular menstruation was better in rural girls (94%) as compared to urban (56%).²⁸ Esimai et al in Nigeria found that 9% girls had irregular cycles. Similar results have been reported in various Indian and International studies.^{14,16,19-25}

Cakir et al found menstrual irregularity among 31.2%, which is quite high and may be due to different definition used in their study.³⁰ Studies have shown that nutrition may influence the menstrual pattern and keeping this in view in present study regularity was compared among the girls showing pallor, thinness and stunting and it was revealed that girls with absence of pallor were 1.2 (0.8-1.9) times more likely to have regular menstruation as compared to those showing pallor and, girls with normal height for age were 1.2 (0.6-2.0) times more likely to have regularity as compared to those with stunting. However no significant difference was found in regularity of menses when compared among girls with thinness, normal BMI for age and overweight ($p > 0.05$).

The measurement of the menarcheal age and cycle length based on the retrospective method compromising the accuracy is the limitation of present study. To mention others come the assessment of physical activity and diet patterns of girls as they may affect menstrual pattern too. Yet other ones that may be associated and should be addressed are variations and morbidities due to poor menstrual hygiene and premenstrual symptoms.

CONCLUSION

This study concluded that maladies of menstruation are common among adolescent girls be it irregular menstrual cycles, cycle length variations, dysmenorrhea, heavy bleeding or scanty flow. Adolescent girls should be educated to have an understanding to differentiate between normal and abnormal menstrual pattern for early identification of potential health concerns. Thus, it is imperative to promote it via school curriculum and for out of school girls already existing efforts under SABLA scheme by Government of India should be accentuated like teaching with a 28 beaded necklace or charts showing timings of the whole cycle. This can definitely improve understanding of girls and can progressively wind-up the social prohibitions to discuss menses related issues. Different menstrual terminologies and their definitions should be reviewed for uniform usage in further research.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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